

## Original Articles

### PLASTER METHODS OF TREATING MUSCLE CONTRACTURES FOLLOWING WOUNDS.

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A large percentage of wounds in the late war caused contractures of the muscles and fascial tissues of the upper and lower extremities, restricting motion in the neighboring joints. If we found the joints normal or with only slight adhesions, and the bones sound or with well healed fractures, we still had left a large group of wounds in the treatment of which the following methods, as developed at the Special Military Surgical Hospital at Birmingham, Eng., have given excellent results.

**Hip**—The usual contracture is adduction from injury to the adductor muscles. It is best treated by gradual abduction, using strong traction on a Jones abduction frame, or by immediate abduction under anesthesia on a Hawley table, and then fixation in plaster.

**Knee**—The usual deformity is one of flexion due to contracture of the hamstring muscles. A plaster splint is applied from the groin to the ankle. The knee, specially well padded over the patella, is in maximum comfortable extension (Fig. 1). After a few days, when the plaster is well dried out, the splint is cut two-thirds the way round at the knee, leaving the anterior third as a hinge. Then as much extension is made as the patient can stand, depending on the degree of fibrosis of the hamstrings, and a cork is inserted to keep this gap open (Fig. 2). The whole is sealed over with a few turns of a plaster bandage. Once or twice a week this procedure is repeated by removing the seal of plaster and inserting a wider cork. If there is much flexion deformity, two or even three plaster splints may be required, and careful watch is kept of the skin over the patella where the fulcrum pressure comes. The advantages of this method over the Turner splint are that the patient cannot ease the corrective strain unbeknown to his medical officer, and, second, it is neither heavy nor bulky; trousers can be worn and the patient is able to be about with or without crutches.

Limitation of power of flexion due to quadriceps injury is better treated by exercises and massage therapy in milder cases, operative measures in severe.

**Ankle**—Here the extremely common contractures of the calf muscles are due either to their own injury and subsequent fibrosis, or to the injury or paralysis of the anterior leg muscles, allowing unopposed contracture of the calf muscles. With either of these two causes the treatment is the same. A plaster splint is applied from the top of the leg to the toes, with maximum dorsiflexion and slight inversion of the foot. When the plaster is dry, a wedge one to two inches wide, depending upon the amount of foot drop, is cut anteriorly over the ankle-joint from malleolus to malleolus (Fig. 3). The foot is then dorsiflexed to the limit of the patient's comfort, thus partially closing the gap, and sealed or fixed in this position with

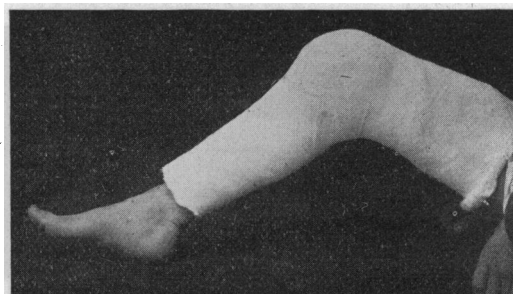


Fig. 1.

Method of gradually extending knee.

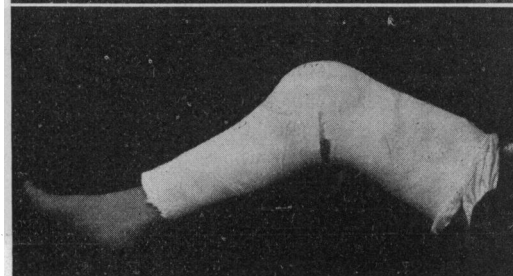


Fig. 2.



Fig. 3.

Method of gradually dorsiflexing foot.



Fig. 4.

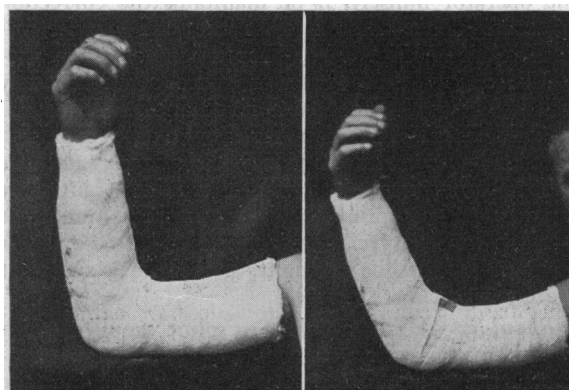


Fig. 5.

Method of gradually extending elbow.

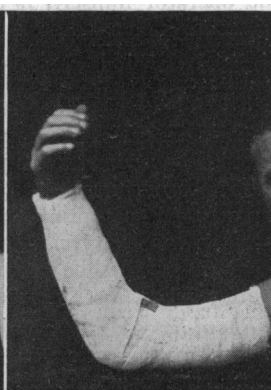


Fig. 6.

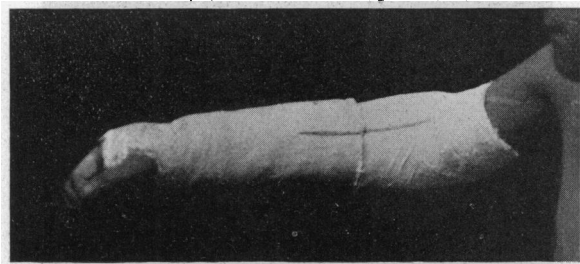


Fig. 7. Fig. 8.  
Method of gradually supinating forearm.

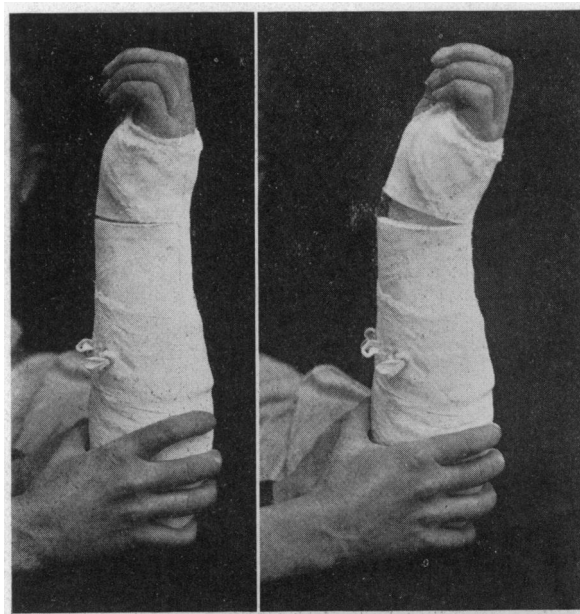


Fig. 9. Fig. 10.  
Method of gradually extending wrist.

a plaster bandage, applied by the assistant or by the operator himself, if he maintains the correction by bracing his chest against the ball of the patient's foot (Fig. 4). Repetition of this procedure a few times once or twice a week rarely fails to bring the foot to a right angle. It should be held in this position for a week to a month depending upon the tendency to relapse, and the patient is encouraged to walk upon it. Cautiously removing the splint, and instituting immediate massage and exercise treatment, with use of a Jones clubfoot shoe at night, should be a sufficient protection against relapse.

**Shoulder**—Here a plaster splint applied with maximum correction of abduction can be cut two-thirds the way round the shoulder, leaving the uppermost third as a hinge. It is then abducted to the limit of comfort, a cork inserted, and plaster

seal applied. This weakens the plaster markedly in a vital place, however, and the ordinary shoulder spica will only stand two or three such corrections when a new one is necessary. This makes it often more practicable to use a metal abduction splint, and bend the stem as needed. But here the usual disadvantage must be considered, that the splint is not completely under the medical officers' control.

**Elbow**—Flexion contracture due to injury of the Biceps or Brachialis Anticus is usually easily corrected by this method. The splint, well padded over the olecranon, is cut two-thirds the way around the front at the joint level (Fig. 5). Extension is made to the limit of comfort and

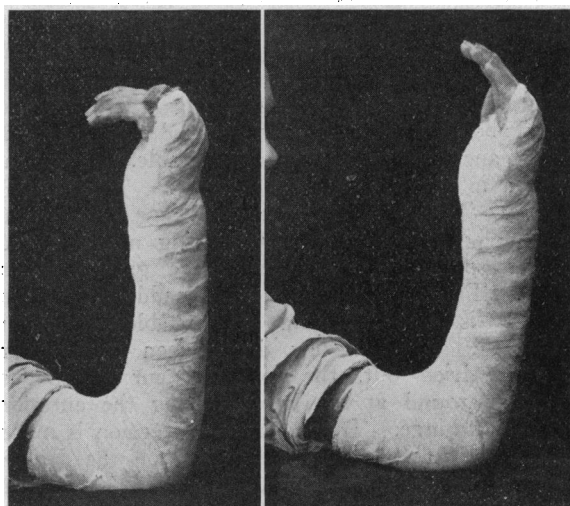


Fig. 12. Fig. 11.

Fig. 14.

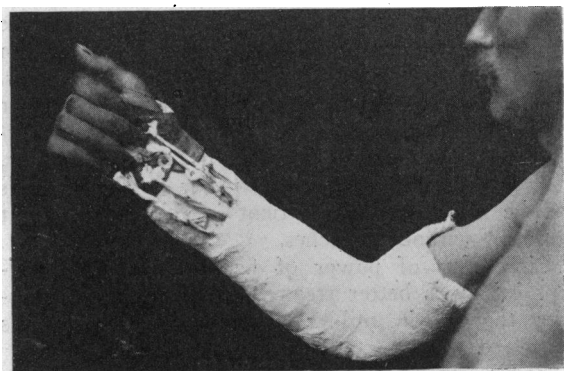


Fig. 13.  
Method of gradually flexing phalanges.

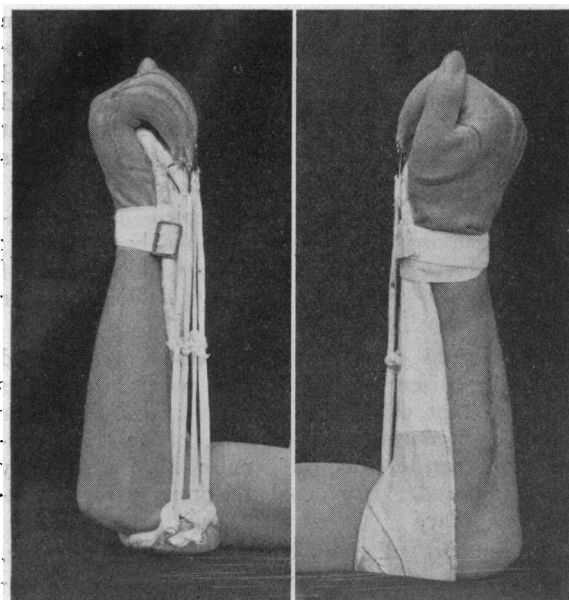


Fig. 15. saw bone splint. Fig. 16. Removable splint for flexing phalanges.

cork inserted (Fig. 6). It is then sealed with plaster in the usual manner.

The gradual correction of complete extension deformity is difficult mechanically (as is similar deformity at the knee), and I have had to resort to open operation in every case before obtaining a right angle.

**Forearm**—Injury to the flexor muscle bellies usually involves the Pronator Radii Teres and causes a pronation deformity. When no bony nor joint obstruction exists, this is easily corrected by a plaster splint extending from three inches above the elbow, which is held at right angle, to the fingers including the wrist, and leaving the fingers and thumb as free as possible for voluntary movements. The plaster in the palm should end two inches above the web of the fingers, just including the thenar eminence. This splint, put on with maximum supination, is cut completely around about three inches below the elbow, several days later (Fig. 7). Further supination of the lower part of the splint is made to the limit of comfort, and the two sections joined or sealed with a plaster bandage (Fig. 8). The procedure is repeated at the usual intervals.

**Wrist**—Flexion deformity from injury to the flexor muscles or tendons is quite common and usually corrected easily by this method, if the wrist joint or carpus is not involved, and even in the latter condition much improvement can be obtained in many cases. The splint is applied to the hand as in forearm supination, except that the thenar eminence is left free (Fig. 9). Correction is made as illustrated, (Fig. 10) and plaster sealed in the usual way.

**Fingers**—The metacarpo-phalangeal joints should usually be considered first, and unless they can flex almost to a right angle, should be treated in the following manner: A plaster splint is applied to the dorsiflexed wrist, coming to the distal ends

of the first or proximal phalanges, which are flexed as much as possible. The splint is reinforced on the dorsum over the fingers by a "slab" made by reduplicating plaster turns. After two or three days, when the plaster is dry, the splint is cut away over the palmar surface of the fingers to the middle of the palm, well above the metacarpal heads, leaving the thickened plaster on the dorsum. Sometimes, not usually, it is advisable to connect front and rear portions by a narrow plaster bridge over the web of the thumb (Fig. 11). Felt pads are now shoved in between the dorsal slab and the fingers to the limit of comfort (Fig. 12), and sealed with plaster (Fig. 13). These pads are added to, weekly or bi-weekly, sealing with plaster each time. With the plaster cut away as described, it is obvious that at all times the patient can move his fingers in the desired direction and in that direction only. This is a great help, and shortens the time of treatment materially.

If the second and third phalanges do not flex sufficiently to bring the ends of the fingers to the palm, a glove can be worn with tapes attached to its finger ends, and fastened to loops passed through holes in the front of a plaster cock-up splint. If there is much resistance on the part of the tissues, the splint counterhold should be obtained by passing the plaster above the right-angled elbow, thus pulling against the lower part of the humerus (Fig. 14). A splint ending below the elbow is pulled downward, and usually causes painful pressure against the base of the first metacarpal.

Lieutenant C. A. Downs, on my service, has devised a neat plaster slab splint, obtaining its hold above the right-angled elbow, and which is removable for massage and exercises (Figs. 15 and 16).

Often several treatments can be carried out in the same splint simultaneously. The commonest combination, perhaps, is flexion of the first phalanges, dorsiflexion of the wrist, and supination of the forearm.

Usually by the time these corrections are completed, the patient has attended to the flexion of the second and third phalanges. If not, a splint with glove as described above, attends to this, or, if far enough along, a removable slab splint with glove can be used, and massage and exercises given daily.

In the severer contractures of the Volkmann type, the distal deformities, according to Jones' rule, should be corrected first.

The plaster treatment is never intended to supplant massage and exercise treatment, but rather to attack the contracture in its most resistant stage and stretch the tissues, in the shortest possible time, to full or over correction, and then gradually give way to massage and exercises, which maintain or increase the correction while restoring activity and suppleness to the affected muscles. This is the true sphere for massage and exercises in difficult cases. Where the contractures are mild or of an easily yielding character, they can be used from the beginning. We have often seen patients coming from general hospitals where fairly severe con-

tractures have been massaged for months with no improvement and with consequent discouragement of patient and masseuse. By graduated stretching in plaster, the worst of the contracture was overcome and the treatment satisfactorily concluded by massage and exercises.

Also with many of the more severe contractures, we have avoided operation with its consequent immediate correction, but prolonged weakness of severed tendon or muscle. We often used to elongate the Tendo Achilles at operation (by Jones' method preferably). Now only the most extreme degree of muscle fibrosis and scarring require its use.

We have also largely avoided rapid stretching under anæsthesia because of the ever present danger of inflammatory reaction and reopening of old wounds. Indeed, even with cautious gradual extension this danger must be thought of. Besides, rapid stretching tears muscle or tendinous tissue, which must be replaced by scar tissue, and our healing and restoration of full function is delayed thereby.

Of course this plaster splint is not at all applicable for correction of the so-called functional contractures. They are quite surely in the province of the neurologist. But I have run across a few cases of mixed or combined etiology, in which there was a definite contracture due to real fibrosis of muscle tissue from a wound, and to which a definite functional element was added, increasing the deformity. Here it had seemed best to have the functional portion of the contracture corrected first, then, with the patient's confidence obtained, proceed with the correction of the organic lesion in the usual manner.

The chief advantage claimed for this—the so-called Wolff method—of gradually stretching muscle contractures over other splint methods, is that it is always under the complete control of the medical officer. The hold cannot be relaxed or intermitted without his knowledge. The splints interfere with clothing and walking as little as possible, and finally, with ordinary skill in plaster technique, the hold should be more easily applied and the pressure more evenly divided than in any other form of apparatus.

#### CASE OF LEPTO-MENINGITIS OF OTITIC ORIGIN.\*

By GEO. S. WELLS, M. D., Santa Barbara.

The occurrence of a meningitis of otitic origin is sufficiently rare to seem to me to be worthy of reporting, especially the one following:

Mr. R. H. D., of Lompoc, reported at my office August 28, 1918. Age 34. Occupation, meat cutter. Married and father of four healthy children. Parents living and well. Three weeks ago contracted heavy cold while out deer hunting, which was speedily followed by severe pain in both ears. For several days temperature had ranged at about 102° maximum, but had gradually decreased, though not to normal, for the whole

24 hours. Had never had any discharge from ears, though a very profuse and offensive discharge from the post nares. Pain about ears had been continuous and past few days had involved the whole head at times. His wife reported that the night before he had become violently delirious and had tried to escape from the house.

Examination of the ears revealed drums congested and bulging; canals markedly reddened; mastoids very sensitive; and marked rigidity of the muscles of the neck. Pulse 66. Temperature normal.

The drums were both anesthetized and incised and he was sent to the hospital with instructions to apply heat over both mastoids and irrigate the canals with normal salt solution. Late that evening temperature was 98°, pulse 48. Pain very much relieved. Instructed to prepare for operation next day.

August 29. Patient had a comfortable night. Stiffness of the neck much less noticeable. Temperature, 98°, pulse 56. He remained quite comfortable all morning and was taken to the operating room at 1 o'clock where we first opened the right mastoid which, though full of pus, showed no complications. On cleaning out the left mastoid we found the dura exposed above the knee of sinus. Gave no appearance of any extension from this exposure either above or into the sinus. The operation was completed in the usual way, packed lightly with sterile gauze, and dressed in the ordinary way. Though he had been three hours under the anesthetic the anæsthetist called our attention to the improvement of his pulse. Smear made and specimen for culture taken during operation. Was restless through the night, though complained of no pain.

August 30. Patient looks bright and is entirely free from pain, though complained of head being sore and wanted extra pillow. Temperature reached 100.6° that day, which was the highest point reached while in the hospital. Pulse 68. After this the temperature ranged about 99° until September 2, when it became normal. The wounds were dressed September 2 and seemed to be doing nicely. Were clean and granulating nicely. The progress from that time until September 7 was uneventful, when he left the hospital and reported to the office for the dressings. Everything was progressing so nicely that on the 11th of September I permitted him to return home and to have Dr. Heiges complete the care. At this time both middle ears were dry and the mastoids granulating elegantly and clean.

On September 16th I was very much surprised to see him stagger in to the office supported by his wife. Examination showed a profuse discharge from the left mastoid and slight discharge from the middle ear. Right clean and nearly filled. Marked rigidity of neck muscles. Patient complained of intense headache. Tongue furred and foetid breath. Wife reported that he had been fine until 1:30 that morning. The evening before had eaten a hearty supper and been in high spirits all evening, but had awakened at

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